

(No Model.)

T. A. EDISON.

TELEGRAPHY.

No. 370,132.

Patented Sept. 20, 1887.

Fig. 1.

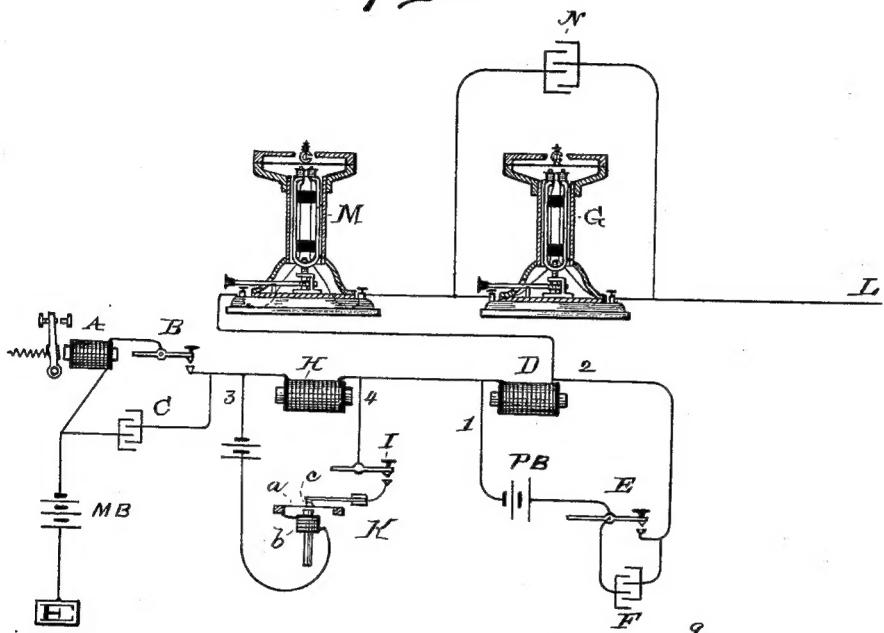


Fig. 3.

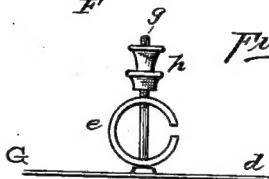
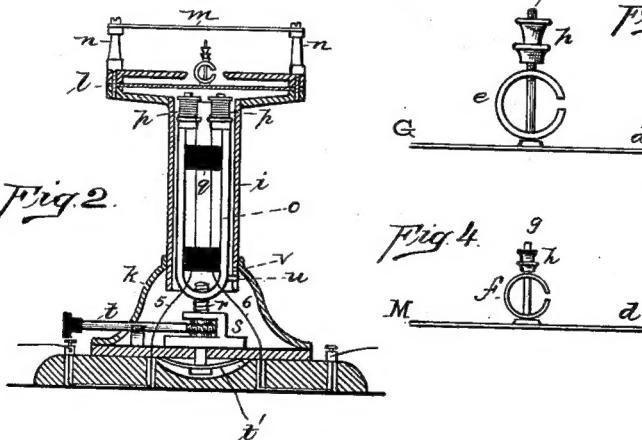


Fig. 2.



# UNITED STATES PATENT OFFICE.

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## TELEGRAPHY.

SPECIFICATION forming part of Letters Patent No. 370,132, dated September 20, 1887.

Application filed May 15, 1886. Serial No. 202,236. (No model.)

*To all whom it may concern:*

Be it known that I, THOMAS A. EDISON, of Menlo Park, in the county of Middlesex and State of New Jersey, have invented a new and useful Improvement in Telegraphy, (Case No. 664,) of which the following is a specification.

The object I have in view is to increase the capacity of telegraph-wires for way as well as terminal stations.

10 In my Patent No. 333,289 I double the capacity of such wires by the use, in addition to the ordinary Morse instruments, of induction apparatus which operates to transmit and receive Morse signals formed by induction impulses independently of and without interference from or with the ordinary Morse signaling-keys and relays. By my present invention I treble the capacity of the ordinary Morse way-line by the use of apparatus in many respects similar to the induction apparatus described in my said patent.

25 In carrying out my invention I use upon the same wire the ordinary Morse instruments, consisting of a line-battery, signaling-keys and relays, and also simple induction apparatus similar to that described in the patent referred to, the Morse keys being shunted by condensers to keep the line constantly closed for the induction impulses. In addition to 30 the ordinary Morse and the simple induction apparatus I provide the line with a third class of signal transmitting and receiving apparatus. This, like the simple induction apparatus, also utilizes induction impulses; but instead of 35 transmitting and receiving Morse signals by simple induction impulses of considerable strength, as does the simple induction apparatus, this third apparatus employs rapidly occurring induction waves or vibrations which 40 form a musical note, such note being divided at the transmitter into dots and dashes for producing Morse harmonic signals. The arrangement is such, as will be presently described, that the three classes of signals are independent.

45 The invention relates, further, to certain details of construction in the transmitting and receiving instruments.

In the accompanying drawings, forming a 50 part hereof, Figure 1 is a view, principally in diagram, illustrating the invention; Fig. 2, an

enlarged sectional view of one of the diaphragm-sounders, and Figs. 3 and 4 views showing the diaphragm-weights and their adjustment for the simple induction and harmonic sounders.

55 In Fig. 1 is illustrated the arrangement of apparatus at one station—a terminal station. This would be the same for all stations, except, of course, that at way stations there would be no line-battery. The line L L is the usual Morse line, with main battery M B, Morse relays A, and ordinary signaling-keys, B, the latter being shunted, preferably, by condensers C to keep the line closed for the induction impulses. With these ordinary Morse instruments telegraphing between all stations provided with them—both terminal and way—will be carried on in the usual manner by opening and closing the line-circuit of the battery M B. At each office there is also a set of simple induction instruments, comprising an induction-transmitter and a diaphragm sounder or receiver. The simple induction-transmitter is preferably composed of magnet-coils D, 75 located directly in the line and shunted by circuit 1 2, including a battery, P B, and signaling-key E, the latter being shunted by a condenser, F, to sharpen the waves and absorb the spark. The simple induction-receiver is a 80 diaphragm-sounder, G, which is preferably an instrument similar to an ordinary magneto-electric telephone-receiver, but differing therefrom in respects which will be pointed out.

85 By opening and closing the simple induction-transmitter shunt at key E the magnet-coils D will be charged and discharged, and simple induction impulses will be thrown upon the line, which will be responded to by the receiver G. The harmonic transmitter has 90 magnet-coils H in the line, and shunt 3 4 around these coils includes a battery, H B, a signaling-key, I, and a vibrating circuit-controller, K. This last instrument has a diaphragm-armature, a, and a magnet, b, similar to a magneto-electric telephone-receiver. The diaphragm controls contact-points c, at which the shunt 3 4 is opened and closed, such points and the coils of b being directly in circuit 3 4. This form of circuit-controlling vibrator is 95 highly efficient for giving rapid vibrations. The harmonic receiver is a diaphragm-sounder, 100

M, located directly in the line. Upon the diaphragms *d* of G and M are mounted hopping weights *e,f*. These are held loosely by pins *g*, rising from the center of the diaphragms and passing through such weights. Limiting-nuts *h* are screwed on the upper ends of the pins *g*. As will be seen by Figs. 3 and 4, the weight *f* of the harmonic sounder is much lighter than weight *e* of the simple induction-sounder, and while weight *e* is permitted a considerable movement on its pin, the limiting-nuts for weight *f* are adjusted so that this weight has an exceedingly small movement, which may not be more than one-thousandth of an inch. The diaphragm of M, carrying this light weight *f*, responds to the rapid or harmonic vibrations, which are not strong enough to sensibly disturb the heavier weight, *e*, which, however, responds to the strong simple induction-waves, and, in addition, the sounder G is shunted by a small condenser, N, which quite completely absorbs the rapidly-occurring but weak harmonic vibrations, so far as their effect upon this sounder is concerned. Thus the simple induction and harmonic instruments will be independent in their action of each other and of the ordinary Morse instruments, which are too sluggish to respond to the induced impulses.

The harmonic and simple induction receivers are both diaphragm-sounders of similar construction. These, as shown, have each an upright tubular body, *i*, resting on a hollow base, *k*. At the upper end of the tubular body *i* is a larger circular case, *l*, holding the horizontal metallic diaphragm. Through an opening in the center of the top of case *l* the diaphragm-weight projects, as shown. Above this is a horizontal plate, *m*, supported by posts *n* from diaphragm-case, the function of which is to protect the weight from accidental injury.

The magnet *o* is preferably an elongated horseshoe permanent magnet with its poles presented to the under side of the metal diaphragm and carrying coils *p*, the wires 5 6 from which run down through the tubular body and hollow base to binding-posts for circuit-connections. The sides of the elongated horseshoe-magnet *o* are connected by blocks *q* to give stiffness, and this magnet is supported in the tubular body by a vertical screw, *r*, which turns in its yoke and is adjusted by means of a worm, *s*, and a horizontal worm-spindle, *t*, a spring, *t'*, being used to hold the parts in adjustment. A pin, *u*, on *o* works in slot *v* in tubular body to guide the magnet in its vertical movement.

Another peculiar feature is the construction of the diaphragm-weights. These are designed to increase the sound emitted by striking on the diaphragm. I prefer for this purpose a metal weight constructed to be resonant and made as a ring standing on edge, and preferably open at one side, as shown in the drawings, to increase the sound.

What I claim is—

1. In telegraphs, the combination, with a line-wire, of (a) sets of Morse telegraph-instruments consisting each of an ordinary relay and a signaling-key and shunt-circuits to keep the line constantly closed for induction impulses at the signaling-keys, (b) sets of Morse telegraph-instruments consisting each of an induction-transmitter producing Morse signals composed of simple induction impulses and a diaphragm-sounder responding to such simple induction impulses, and (c) sets of Morse telegraph-instruments consisting each of an induction-transmitter producing Morse signals composed of harmonic or rapidly-occurring induction vibrations and a diaphragm-sounder responding to such harmonic induction vibrations, substantially as set forth. 70
2. In telegraphs, the combination, with a line-wire, of (a) sets of Morse telegraph-instruments consisting each of an induction-transmitter producing Morse signals composed of simple induction impulses and a diaphragm-sounder responding to such simple induction impulses, and (b) other sets of Morse telegraph-instruments consisting each of an induction-transmitter producing Morse signals composed of harmonic or rapidly-occurring induction vibrations and a diaphragm-sounder responding to such harmonic induction vibrations, substantially as set forth. 80
3. In telegraphs, the combination, with a line-wire, of (a) sets of Morse telegraph-instruments consisting each of an induction-transmitter producing Morse signals composed of simple induction impulses, a separate source of electrical energy, and a diaphragm-sounder responding to such simple induction impulses, and (b) other sets of Morse telegraph-instruments consisting each of an induction-transmitter producing Morse signals composed of harmonic or rapidly-occurring induction vibrations, a separate source of electrical energy, and a diaphragm-sounder responding to such harmonic induction vibrations, substantially as set forth. 90
4. In telegraphs, the combination, with a line-wire, of sets of Morse telegraph-instruments, each consisting of an induction-transmitter producing Morse signals composed of simple induction impulses and a diaphragm-sounder, and other sets of Morse telegraph-instruments consisting each of an induction-transmitter producing Morse signals composed of harmonic or rapidly-occurring induction vibrations, and a diaphragm-sounder, the sounders of the two classes having diaphragm-weights of different weight and adjustment, substantially as set forth. 105
5. In telegraphs, the combination, with a line-wire, of sets of Morse telegraph-instruments, each consisting of an induction-transmitter producing Morse signals composed of simple induction impulses and a diaphragm-sounder, and other sets of Morse telegraph-instruments consisting each of an induction- 115
- 120
- 130

transmitter producing Morse signals composed of harmonic or rapidly-occurring induction vibrations and a diaphragm-sounder, the diaphragm-sounders of the first class of instruments being shunted by condensers, substantially as set forth.

6. In telegraphs, the combination, with a line-wire, of sets of Morse telegraph-instruments, each consisting of an induction-transmitter producing Morse signals composed of simple induction impulses and a diaphragm-sounder, and other sets of Morse telegraph-instruments consisting each of an induction-transmitter producing Morse signals composed of harmonic or rapidly-occurring induction vibrations, and a diaphragm-sounder, the sounders of the two classes having diaphragm-weights of different weight and adjustment, and the diaphragm-sounders of the first class 15 of instruments being shunted by condensers, substantially as set forth.

7. In telegraphs, the combination, with a signaling-key, an induction device, and a source of electrical energy, of a transmitting self making and breaking vibrator, consisting 25 of a magnet, a diaphragm-armature, and contact-points directly in circuit with said magnet and controlled by the movement of such diaphragm-armature, substantially as set forth.

8. In telegraphs, a harmonic Morse signal-transmitter having in combination magnet-

coils in the line and a shunt connected with the line around such magnet-coils, said shunt including a battery, a circuit making and breaking vibrator, and a signaling-key, substantially as set forth.

9. In telegraphs, a diaphragm-sounder having in combination a vertical magnet, a horizontal diaphragm, a hopping weight on such diaphragm, and a horizontally-located adjusting-spindle for changing the vertical position of the magnet, substantially as set forth.

10. In telegraphs, the combination, in a diaphragm-sounder, of a horizontal diaphragm, a supporting-case for the same, a hopping weight and holding-pin mounted on said diaphragm and projecting upwardly from the same above the case, and a horizontal protecting-plate supported from said case and extending across the same above the hopping weight, substantially as set forth.

11. In telegraphs, the combination, with a diaphragm-sounder, of a diaphragm hopping weight consisting of a split ring standing on its edge on the diaphragm, substantially as set forth.

This specification signed and witnessed this 11th day of May, 1886.

THOS. A. EDISON.

Witnesses:

A. W. KIDDLE,  
M. F. KELLY.